Gender differences in the perception of difficulty of self-management in patients with diabetes mellitus: a mixed-methods approach

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Abstract

Aim The aim of this study was to examine the challenges of self-management of diabetes comparing gender.

Methods Sixty-four women and 129 men (mean age 63 vs. 60 years) with diabetes mellitus (DM) were interviewed using 12 categories (classification codes b1300, d240, d570, d620, d845, d920, e410 + e414, e420, e425, e465, e560) related to self-care management selected from 99 categories of the International Classification of Functioning, Disability and Health (ICF) Core Set for DM. In a mixed-methods analysis, interviews were analyzed according to the Grounded Theory approach, and gender effects on ICF categories related to self-care management were investigated using logistic models.

Results In quantitative data, compared with men, women tended to experience greater difficulty obtaining foods/ingredients for well-balanced meals to maintain appropriate glucose level ($P = 0.004$); handling stress and other psychological demands around diabetes treatment ($P = 0.034$); and social norms, practices, and ideologies that defined an experience of unpleasant treatment after

disclosure of DM diagnosis to close family and friends ($P = 0.023$). Qualitative data shows that women perceived prejudice against people with DM from close family, friends, and neighbors. In contrast, men reported excessive media information on diabetes treatment, which induced prejudice by family members and at the workplace.

Conclusions Women were more likely to be sensitive to attention from close family and friends, whereas men were more likely to be occupied by work and daily living concerns. Health professionals should pay attention to such gender differences in a patient–professional relationship.

Keywords Diabetes · Gender · Self-management · Mixed-methods

Introduction

Historically, Japanese doctors have had a strong paternalistic relationship with their patients [1]. Typically, patients leave all decision making about their healthcare to their doctors. This trend is stronger among female and older patients [2]. This behavior sometimes causes patients to become confused or to not fully understand their illness. This can impact treatment or disease outcome [3].

The active participation of patients in self-management of diabetes is as important as treatment by the physician. It is well known that patients with diabetes struggle with self-management of the disease and that men and women have different types of difficulty. Most findings from previous studies found that women were more likely to report psychosocial distress, including lower levels of coping status and self-efficacy and higher levels of depressive symptoms compared with men [4–7]. One report specifically commented that men with diabetes reported less distress and a

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greater sense of well-being than women patients with diabetes [8].

Although these previous studies were able to demonstrate gender differences, they failed to explore how environment or context affected gender differences and in what conditions women were more likely than men to encounter such difficulties. If self-management differs according to gender, health professionals need to be aware of these differences to ensure they support patients appropriately depending on patient gender. For this reason, we used a mixed-methods study design involving both quantitative and qualitative methods. Hence, the aim of this study was to examine how gender impacts diabetes self-management.

Materials and methods

Study participants

A total of 193 consecutive diabetes patients were recruited from two diabetes institutes: (1) 82 patients were recruited from the Ishiguro Internal Medical Clinic in Kasugai, Japan, from October to December 2008 and from February to March 2010; (2) 111 patients were recruited from the Akishima Clinic in Nagoya, Japan, in September 2009, from January to August 2010, and from May to July 2011. Written informed consent was obtained from all patients, and the study was approved by the committee of the Research Center of Health, Physical Fitness, and Sports, Nagoya University (approval number 802, 21-8).

International Classification of Functioning, Disability and Health Core Set for Diabetes Mellitus

Patients were interviewed using the International Classification of Functioning, Disability and Health Core Set for Diabetes Mellitus (ICF-CS for DM) [9] and asked whether they had experienced difficulty in each category around diabetes treatment. Of the 99 categories in the ICF-CS for DM [9], 36 belong to “Body functions” (classification code b), 16 to “Body structures” (s), 18 to “Activities and participation” (d), and 29 to “Environmental factors” (e). Each component was translated into Japanese by the Ministry of Health, Labour and Welfare, and a Japanese edition was published in 2002. Validity of the Japanese version has been investigated [10].

Study design

We used a mixed-methods design [11] and collected both quantitative and qualitative data using the interview

process. Analyses from quantitative and qualitative data complimented each other: one set focused on experiencing problems associated with self-management and the other on detailed explanation of the experience. One interviewer (HT) conducted all interviews, which were semistructured and lasted between 40 and 60 min. Outcome was measured using ICF-CS for DM categories. Participants were asked to report whether or not they experienced difficulty using any one of the 99 categories [9]. If they answered “yes,” participants were asked to provide a detailed explanation, which was then used for further qualitative research. Thus, only categories in which participants reported having difficulty with self-management were analyzed. There were 12 categories, as follows:

1. b1300 Energy level: Have you ever felt tired of taking care of your diabetes treatment on your own?
2. d240 Handling stress and other psychological demands: Have you ever had difficulty handling stress and other psychological demands related to diabetes treatment?
3. d570 Looking after one’s health: Have you ever had difficulty managing diabetes treatment, including diet/exercise/medication?
4. d620 Acquisition of goods and services: Have you ever had difficulty obtaining food/ingredients for well-balanced meals to maintain appropriate glucose levels?
5. d845 Acquiring, keeping, and terminating a job: Have you ever been refused employment, demoted from a higher position at your workplace, or transferred against your wishes to a department because you have diabetes? Or have you ever changed your employment status from full time to part time or been advised to resign because you have diabetes?
6. d920 Recreation and leisure: Are there any recreational or leisure activities you were unable to continue because you were diagnosed with diabetes?
7. e410 + e415 Individual attitudes of immediate (i.e., e410) and extended (i.e., e415) family members: Have the attitudes of immediate and extended family members disturbed your diabetes treatment?
8. e420 Individual attitudes of friends: Have the attitudes of your friends disturbed your diabetes treatment?
9. e425 Individual attitudes of acquaintances, peers, colleagues, neighbors, and community members: Have the attitudes of your acquaintances, peers, colleagues, neighbors, and community members disturbed your diabetes treatment?
10. e465 Social norms, practices, and ideologies: Have you experienced unpleasant reactions after disclosing to others that you were diagnosed with diabetes?

11. e560 Media services, systems and policies: There are many media health programs on diabetes. Have you ever had difficulty choosing appropriate information about diabetes treatment and management from the media? Moreover, has your glycemic control worsened as a result of believing particular health information and practice introduced by the media?

Analyses

ICF categories for diabetes and patient characteristics were statistically investigated for gender differences. The χ^2 test or Fisher's exact test was used for categorical variables and the *t* test for continuous variables. Crude and adjusted odds ratios (ORs) and 95 % confidence interval (95 % CI) were computed to investigate the gender effect on each selected ICF category. A multivariate logistic model adjusted for age, presence of nephropathy, and employment status. Significance levels were set at $P < 0.05$. All statistical analyses were carried out using SPSS software (SPSS, version 19.0, SPSS Japan, Tokyo, Japan).

Responses to the open-ended questions were qualitatively analyzed. Gender was analyzed in-depth and using the Grounded Theory approach [12]. Data were scrutinized line by line to identify the codes expressed. Related codes were labeled and grouped into categories, and categories were conceptualized by specifying the relationship between them. HT developed the initial codes and KN reviewed the coding scheme. The codes were then organized into properties and domains and further into broader categories associated with diabetes self-management.

Results

Quantitative results

Characteristics of study participants are shown in Table 1. There were 64 women (33.2 %) and 129 men (66.8 %), with women being significantly older than men [mean $\pm$ standard deviation (SD) 63 $\pm$ 14 vs. 60 $\pm$ 13 years, respectively; $P = 0.093$]. The majority of men (67.4 %) and nearly half the women (46.9 %) were employed at the time of the investigation ($P = 0.006$). The majority of participants had type 2 DM regardless of gender (82.8 % of women and 86.0 % of men). One fourth of men (24.0 %) and one third of women (34.4 %) used insulin ($P = 0.130$).

The majority (70.3 % of women and 67.4 % of men) had at least one complication. No statistical differences were observed between women and men in the prevalence of neuropathy (3.1 vs. 1.6 %, respectively) or retinopathy (23.4 vs. 24.0 %, respectively); however, men were more likely to

have nephropathy (37.5 vs. 54.3 %, respectively; $P = 0.028$). Hemoglobin A1c levels were not statistically different ($P = 0.570$): 7.1 $\pm$ 1.3 vs. 7.0 $\pm$ 1.4 %. Response patterns and results of the logistic regression models for the 99 ICF-CS for DM categories are shown in Tables 2–5. Diabetic women had greater concerns than diabetic men in the following categories: seeing (b210; 53.1 vs. 37.2 %; $P = 0.035$); immunological system (b435; 26.6 vs. 13.2 %; $P = 0.022$); sympathetic nervous system and parasympathetic nervous system (s140 and s150 respectively 17.2 vs. 3.1 %; $P = 0.001$); reproductive system (s630; 31.3 vs. 9.3 %; $P < 0.001$). Women also had more difficulty handling stress and other psychological demands of diabetes treatment (d240; 40.6 vs. 25.6 %; $P = 0.033$); had more difficulty acquiring goods and services (d620; 15.6 vs. 3.1 %; $P = 0.003$); and experienced a higher incidence of concerns about social norms, practices, and ideologies. These concerns were defined as unpleasant reactions from others after disclosing their diagnosis of diabetes (e465; 29.7 vs. 15.5 %; $P = 0.021$). In contrast, men had greater concerns in the following categories: urination (b620; 45.7 vs. 23.4 %; $P = 0.003$); kidney (s6100; 54.3 vs. 37.5 %; $P = 0.028$); fine-hand use (d440; 34.9 vs. 20.3 %; $P = 0.038$).

In the results of logistic regression models, the significant categories of ICF-CS for DM were b210 ($P = 0.036$), b435 ($P = 0.024$), s140 and s150 ($P = 0.002$), s630 ($P < 0.001$), d240 ($P = 0.034$), d620 ($P = 0.004$), and e465 ($P = 0.023$).

After adjusting for age, presence of nephropathy, and employment status, multivariate analysis showed that women were more likely than men to have hypertension (b420; OR 2.02, CI 1.02–3.99), sympathetic nervous system and parasympathetic nervous system (s140 and s150; OR 6.60, CI 1.90–22.96), and reproductive system (s630; OR 3.87, CI 1.61–9.30) issues. They were also more likely to have difficulty acquiring goods and services (e.g., going shopping) (d620; OR 6.41, 95 % CI 1.80–22.82), friends who were uncomfortable discussing their diabetes treatment (e420; OR 5.25, 95 % CI 1.11–24.92), and unpleasant reactions from others after disclosing their diabetes diagnosis (e465; OR 2.95, 95 % CI 1.35–6.45).

Qualitative results

Women

Five categories were generated (Fig. 1): strict self-management; loss of vitality and friendship; decline related to diabetes treatment, including frequency of going out and activities of daily living, prejudice against diabetes, and anxiety about hypoglycemic attacks and complications. These categories were further grouped into two themes: (1) Loss of vitality and friendship due to strict self-management, and (2) prejudice against diabetes.

Table 1 Basic patient characteristics

	Women (<i>n</i> = 64)	Men (<i>n</i> = 129)	<i>P</i> value
Age (mean ± SD)	63 ± 14	60 ± 13	0.093
T2DM	82.8	86.0	0.554
Duration of diabetes (mean ± SD)	12.6 ± 10.1	10.5 ± 8.0	0.146
HbA _{1c} (mean ± SD)	7.1 ± 1.3	7.0 ± 1.4	0.570
Insulin therapy (used %)	34.4	24.0	0.130
Complications (yes %)	70.3	67.4	0.686
Retinopathy	23.4	24.0	0.927
Neuropathy	3.1	1.6	0.470
Nephropathy	37.5	54.3	0.028
Cerebral vascular disorder	9.8	7.8	0.988
Cardiovascular disorder	7.8	7.0	0.833
Employment (yes %)	46.9	67.4	0.006
Job type (yes %)			
Office worker	17.2	46.5	
Full-time housewife	26.6	1.6	
Unemployed	25.0	31.0	
Part time	10.9	1.6	
Technical	4.7	7.0	
Independent business	12.5	11.6	
Public servant	0	0.8	
Student	1.6	0	
Workshop	1.6	0	
Family history (yes %)	50.0	46.5	0.648
Lifestyle			
Exercise (yes %)	54.7	68.2	0.066

Age, DM duration, and HbA_{1c} are shown as mean ± SD. χ^2 tests were used for comparisons of sex, DM type, insulin use, retinopathy, neuropathy, cerebral vascular disorder, cardiovascular disorder, and employment. The unpaired *t* test was used for comparisons of age, DM duration, and HbA_{1c} levels. HbA_{1c} level expressed according to recommendations of the National Glycohemoglobin Standardization Program
DM diabetes mellitus, SD standard deviation, T2DM type 2 DM

Loss of vitality and friendship due to strict self-management Psychological stress was caused by implementation of strict self-management related to weight control, medication, diet therapy, and insulin therapy. For example: “I often ended up eating excessively because the portions of food are not very much. I know I can exercise but...” “I am fed up with taking medicine.” “It is so burdensome for me to inject insulin in front of people or outside.”

Loss of vitality and friendship related to diabetes treatment caused further activity decline in frequency of going out and activities of daily living. For example: “I stopped gathering with friends because I cannot eat the same meals they do.” “I used to travel a lot, but I stopped because I do not want to inject myself in front of my friends.”

Participants felt anxiety and fear about hypoglycemic attacks and complications associated with diabetes; for example, one participant reported: “I cannot do anything because I am too afraid of having a hypoglycemic attack.”

In order to prevent these feared symptoms, study participants indicated they were intensively involved in self-management, which is very difficult to communicate to friends, and hence they often lose their passion for activities.

Prejudice against diabetes Our participants experienced prejudice from family, friends, neighbors, and society. For example: “One of my friends talked behind my back saying that I deserve diabetes because I always eat gorgeous foods.” “I was left out of a neighborhood event because I am diabetic. Even though I can participate in any events not linked to eating.” “I was blamed for having diabetes by my family because I have to be on a different diet (which creates an additional burden for my wife).” “I was disappointed to hear my friend say that I deserved blindness because I have diabetes.”

Hence, prejudice appeared to reduce opportunities for socializing with other people, which created greater psychological stress.

Table 2 Gender effect on ICF categories in component of body functions

ICF category		Women (%) <i>n</i> = 64	Men (%) <i>n</i> = 129	<i>P</i> value*	Logistic regression analysis			
					Univariate		Multivariate ^a	
					OR	<i>P</i>	OR	95 % CI
b110	Consciousness functions	26.6	17.8	0.159	1.67	0.161	1.38	0.64–2.95
b130	Energy and drive functions	40.6	39.5	0.884	1.05	0.884	1.09	0.57–2.09
b1300	Energy level	28.1	30.2	0.763	0.90	0.763	1.06	0.53–2.14
b1302	Appetite	31.3	20.9	0.116	1.72	0.118	1.44	0.69–3.01
b134	Sleep functions	50.0	50.4	0.960	0.99	0.960	1.01	0.51–2.00
b140	Attention functions	28.1	33.3	0.464	0.78	0.464	0.92	0.46–1.85
b152	Emotional functions	26.6	19.4	0.255	1.51	0.257	1.42	0.67–2.99
b210	Seeing functions	53.1	37.2	0.035	1.91	0.036	1.50	0.78–2.89
b260	Proprioceptive function	34.4	38.0	0.624	0.86	0.625	0.93	0.47–1.84
b265	Touch function	0	3.1	0.304	–	–	–	–
b270	Sensory functions related to temperature and other stimuli	1.6	0	0.332	–	–	–	–
b280	Sensory of pain	37.5	33.3	0.567	1.20	0.567	1.01	0.52–1.96
b410	Heart functions	29.7	27.1	0.710	1.13	0.710	1.07	0.53–2.16
b415	Blood vessel functions	12.5	15.5	0.668	0.78	0.578	0.59	0.23–1.51
b420	Blood pressure functions	67.2	54.3	0.086	1.73	0.088	2.02	1.02–3.99
b430	Hematological system functions	10.9	14.7	0.468	0.71	0.469	0.56	0.21–1.49
b435	Immunological system functions	26.6	13.2	0.022	2.38	0.024	2.17	0.97–4.85
b455	Exercise tolerance functions	34.4	30.2	0.560	1.21	0.560	0.97	0.49–1.92
b4550	General physical endurance	32.8	26.4	0.350	1.34	0.350	1.15	0.57–2.29
b4551	Aerobic capacity	28.1	21.7	0.324	1.41	0.326	1.30	0.63–2.68
b4552	Fatigability	51.6	38.8	0.091	1.68	0.092	1.49	0.78–2.85
b515	Digestive functions	39.1	36.7	0.644	1.16	0.644	1.29	0.66–2.52
b530	Weight maintenance functions	18.8	24.8	0.345	0.70	0.347	0.69	0.31–1.53
b540	General metabolic functions	6.3	8.5	0.777	0.72	0.579	1.01	0.29–3.59
b545	Water, mineral, and electrolyte balance functions	3.1	1.6	0.601	2.05	0.479	2.16	0.27–17.47
b555	Endocrine gland functions	12.5	11.6	0.819	1.09	0.860	1.10	0.41–2.97
b610	Urinary excretory functions	28.1	27.1	0.884	1.05	0.884	0.79	0.39–1.63
b620	Urination functions	23.4	45.7	0.003	0.36	0.003	0.34	0.16–0.73
b630	Sensations associated with urinary functions	1.6	6.2	0.276	0.24	0.183	0.31	0.04–2.64
b640	Sexual functions	6.3	7.0	1.000	0.89	0.850	1.06	0.29–3.80
b710	Mobility of joint functions	26.6	34.1	0.288	0.70	0.290	0.60	0.29–1.22
b730	Muscle power functions	23.4	14.7	0.135	1.77	0.138	1.84	0.82–4.14
b810	Protective functions of the skin	26.6	20.9	0.380	1.37	0.381	1.07	0.50–2.25
b820	Repair functions of the skin	31.3	27.1	0.551	1.22	0.551	1.14	0.57–2.29
b840	Sensation related to the skin	42.2	34.9	0.323	1.36	0.324	1.26	0.65–2.43

OR odds ratio, ICF International Classification of Functioning, Disability and Health, CI confidence interval

* χ^2 test

^a Adjusting for age, presence of nephropathy, and employment status

Men

Six categories were generated comprising excess media information on diabetes treatment, prejudice against diabetes, family members acting as diabetes police, implementation of self-management, and effect of treatment on

employment (Fig. 2). These categories were further grouped into two themes: (1) Spreading the effect of prejudice among patients, families, and work colleagues by excessive media information on diabetes treatment; (2) Self-management at work.

Table 3 Gender effect on ICF categories in component of body structures

ICF category		Women (%) <i>n</i> = 64	Men (%) <i>n</i> = 129	<i>P</i> value*	Logistic regression analysis			
					Univariate		Multivariate ^a	
					OR	<i>P</i>	OR	95 % CI
s140	Structure of sympathetic nervous system	17.2	3.1	0.001	6.49	0.002	6.60	1.90–22.96
s150	Structure of parasympathetic nervous system	17.2	3.1	0.001	6.49	0.002	6.60	1.90–22.96
s220	Structure of eyeball	39.1	27.9	0.117	1.66	0.118	1.29	0.65–2.57
s410	Structure of cardiovascular system	31.3	23.3	0.233	1.50	0.234	1.34	0.66–2.74
s4100	Heart	25.0	19.4	0.369	1.39	0.370	1.29	0.61–2.75
s4101	Arteries	10.9	4.7	0.101	2.52	0.111	3.34	0.96–11.63
s4102	Veins	4.7	3.1	0.687	1.54	0.581	1.66	0.33–8.25
s4103	Capillaries	3.1	1.6	0.601	2.05	0.479	1.04	0.11–9.50
s550	Structure of pancreas	0	0	NA	NA	NA	NA	NA
s610	Structure of urinary system	26.6	31.0	0.524	0.81	0.524	0.77	0.37–1.61
s6100	Kidneys	37.5	54.3	0.028	0.51	0.029	–	–
s630	Structure of reproductive system	31.3	9.3	<0.001	4.43	<0.001	3.87	1.61–9.30
s750	Structure of lower extremity	20.3	17.1	0.580	1.24	0.581	1.48	0.63–3.47
s7502	Structure of ankle and foot	10.9	7.0	0.347	1.64	0.351	1.64	0.54–4.97
s810	Structure of areas of skin	12.5	16.3	0.489	0.74	0.490	1.07	0.39–2.95
s830	Structure of nails	59.4	61.2	0.803	0.93	0.803	0.92	0.48–1.77

OR odds ratio, ICF International Classification of Functioning, Disability and Health, CI confidence interval

* χ^2 test

^a Adjusting for age, presence of nephropathy, and employment status

Table 4 Gender effect on ICF categories in component of activities and participation

ICF category		Women (%) <i>n</i> = 64	Men (%) <i>n</i> = 129	<i>P</i> value*	Logistic regression analysis			
					Univariate		Multivariate ^a	
					OR	<i>P</i>	OR	95 % CI
d240	Handling stress and other psychological demands	40.6	25.6	0.033	1.99	0.034	1.83	0.93–3.59
d440	Fine hand use	20.3	34.9	0.038	0.48	0.040	0.53	0.25–1.12
d450	Walking	21.9	19.4	0.684	1.17	0.685	1.21	0.49–3.01
d455	Moving around	9.4	6.2	0.424	1.57	0.427	1.20	0.35–4.12
d475	Driving	9.4	10.9	0.751	0.85	0.751	1.01	0.35–2.91
d520	Caring for body parts	7.8	5.4	0.537	1.48	0.520	1.65	0.47–5.74
d570	Looking after one's health	29.7	31.0	0.851	0.94	0.851	1.06	0.52–2.15
d620	Acquisition of goods and services	15.6	3.1	0.003	5.79	0.004	6.41	1.80–22.82
d630	Preparing meals	3.1	5.4	0.720	0.56	0.481	0.55	0.10–2.93
d750	Informal social relationships	4.7	7.0	0.754	0.66	0.538	0.82	0.20–3.38
d760	Family relationships	6.3	4.7	0.733	1.37	0.638	1.34	0.34–5.26
d770	Intimate relationships	3.1	3.9	1.000	0.80	0.793	0.97	0.17–5.62
d845	Acquiring, keeping, and terminating a job	1.6	7.8	0.104	0.19	0.116	0.19	0.02–1.58
d850	Remunerative employment	3.1	5.4	0.720	0.56	0.481	0.71	0.14–3.74
d920	Recreation and leisure	12.5	9.3	0.493	1.39	0.494	1.80	0.63–5.12
d9201	Sports	4.7	4.7	1.000	1.01	0.991	0.98	0.22–4.34
d9204	Hobbies	4.7	5.4	1.000	0.86	0.828	0.98	0.22–4.45
d9205	Socializing	10.9	9.3	0.720	1.20	0.720	1.44	0.51–4.08

OR odds ratio, ICF International Classification of Functioning, Disability and Health, CI confidence interval

* χ^2 test

^a Adjusting for age, presence of nephropathy, and employment status

Table 5 ICF related questions by gender and gender effect on ICF categories in component of environmental factors

ICF category	Women (%) <i>n</i> = 64	Men (%) <i>n</i> = 129	<i>P</i> *	Logistic regression analysis				
				Univariate		Multivariate ^a		
				OR	<i>P</i>	OR	95 % CI	
e110 Products or substances for personal consumption	9.4	12.4	0.533	0.73	0.534	0.75	0.26–2.20	
e115 Products and technology for personal use in daily living	0	0.8	1.000	–	–	–	–	
e310 Immediate family	4.7	1.6	0.335	3.12	0.219	3.65	0.54–24.54	
e315 Extended family	0	0	NA	NA	NA	NA	NA	
e320 Friends	1.6	0	0.332	–	–	–	–	
e325 Acquaintances, peers, colleagues, neighbors, and community members	1.6	0.8	0.554	2.03	0.618	1.85	0.10–34.75	
e330 People in positions of authority	0	0	NA	NA	NA	NA	NA	
e340 Personal care providers and personal assistants	0	0	NA	NA	NA	NA	NA	
e355 Health professionals	4.7	0.8	0.107	6.30	0.114	4.23	0.39–46.04	
e360 Other professionals	0	0	NA	NA	NA	NA	NA	
e410 Individual attitudes of immediate family members	6.3	5.4	1.000	1.16	0.816	1.63	0.43–6.24	
e415 Individual attitudes of extended family members	1.6	0	0.332	–	–	–	–	
e420 Individual attitudes of friends	7.8	2.3	0.119	3.56	0.089	5.25	1.11–24.92	
e425 Individual attitudes of acquaintances, peers, colleagues, neighbors, and community members	3.1	4.7	1.000	0.66	0.619	0.89	0.16–4.82	
e430 Individual attitudes of people in positions of authority	0	0.8	1.000	–	–	–	–	
e440 Individual attitudes of personal care providers and personal assistants	1.6	1.6	1.000	1.01	0.995	0.90	0.07–11.48	
e450 Individual attitudes of health professionals	20.3	14.7	0.326	1.48	0.328	1.20	0.50–2.87	
e455 Individual attitudes of other professionals	0	0.8	1.000	–	–	–	–	
e465 Social norms, practices, and ideologies	29.7	15.5	0.021	2.30	0.023	2.95	1.35–6.45	
e510 Services, systems, and policies for the production of consumer goods	0	2.3	0.552	–	–	–	–	
e550 Legal services, systems, and policies	0	0	NA	NA	NA	NA	NA	
e555 Associations and organizational services, systems, and policies	7.8	3.9	0.304	2.10	0.255	2.99	0.77–11.65	
e560 Media services, systems, and policies	25.0	17.8	0.243	1.54	0.245	1.55	0.72–3.36	
e570 Social security services, systems, and policies	12.5	12.4	0.985	1.01	0.985	1.47	0.55–3.95	
e575 General social support services, systems, and policies	1.6	0	0.332	–	–	–	–	
e580 Health services, systems, and policies	43.8	40.3	0.648	1.15	0.648	0.92	0.46–1.82	
e585 Education and training services, systems, and policies	0	0.8	1.000	–	–	–	–	
e590 Labor and employment services, systems, and policies	4.7	12.4	0.124	0.35	0.103	0.40	0.11–1.53	
e595 Political services, systems, and policies	1.6	0	0.332	–	–	–	–	

OR odds ratio, ICF International Classification of Functioning, Disability and Health, CI confidence interval

* χ^2 test

^a Adjusting for age, presence of nephropathy, and employment status

Spreading prejudice among patients, families, and work colleagues by excessive media information on diabetes treatment Excessive media information can lead to prejudice about diabetes treatments among patients, families, and work colleagues. Patients reported that excessive media attention influenced the way they implemented their self-management. For example: “I am confused by too much information related to diabetes treatment.” “I am frustrated by media reports of car accidents induced by hypoglycemic attacks in people with diabetes (causing close family members or friends to become annoyed at my way of implementing self-management).”

Excessive media information caused family members to be cautious about the patient’s diet and exercise, creating a stressful environment. Frequently, family members and friends were eager to help the person with diabetes, but sometimes they did not know the best way to do it. Instead of being supportive, they often turned into diabetes police. For example: “My family tries to tell me what I can or can’t eat.” “My family took away my food because they believed that it was not good for diabetes treatment.” “I was blamed by my family because they said that my diabetes is caused by my bad lifestyle.”

Fig. 1 Factors associated with self-care management of diabetes treatment in women

Fig. 2 Factors associated with self-management of diabetes treatment in men

Patients also experienced prejudice from bosses and colleagues at the workplace: For example: “I was refused a job opportunity because I told them at the interview that I was diagnosed with diabetes.” “I was shocked because my boss told me that I deserve diabetes because I am a lazy person.” “I quit my job because of prejudice from my boss and colleagues.”

Self-management at work Some patients reported difficulty injecting insulin at the workplace. For example: “There is no place for insulin injection.” “I cannot inject myself in front of customers.”

Participants perceived fear of loss of employment opportunities due to self-management. For example: “I lost income to some degree because I cannot drink and eat out with business colleagues and customers due to insulin injections.” “I was assigned to desk duty because outside duty required

drinking alcohol and eating a high-calorie diet. As a result, my salary went down and my family is in poverty.”

Strict implementation of self-management also induces loss of activity. For example: “I stopped traveling because I cannot eat high-calorie foods.” “Due to increased medical costs, I decreased the frequency of playing golf.”

It was suggested that the loss of work or activities of daily living induced by strict implementation of self-management, along with family and friends acting like diabetes police, creates psychological stress among men.

Discussion

We demonstrated that gender differences exist in the perception of difficulty of diabetes self-management. In a quantitative analysis, women were more likely to report not

only physical problems but also psychosocial problems in seven more categories of the ICF-CS for DM than men (six and two, respectively, for physical problems; four and one, respectively, for psychosocial problems). Even after adjusting for age, nephropathy, and employment status, women were more likely to report problems with the sympathetic and parasympathetic nervous systems, the reproductive system, acquisition of goods and services; and social norms, practices, and ideologies. These findings are consistent with previous reports in the literature. One review reported that glycemic variability may affect the sympathovagal balance by increasing oxidative stress and proinflammatory cytokines [13]. Another study reported that sympathovagal balance dysfunction is associated more with women with type 2 diabetes than with their men counterparts, and that visceral adiposity contributes to autonomic imbalance [14]. The difficulties with instrumental activities of daily living (i.e., shopping) among women in this study may reflect the stereotypical belief embedded in the Japanese culture that women do not work outside the home and men are the breadwinners [15].

On the other hand, men were more likely to report issues with urination functions and fine-hand use (e.g., numbness of the fingertips), adjusting for covariates such a high response rate for the category of urination function, which may be explained by the higher prevalence of nephropathy among men. With regard to fine-hand use, there might have been a larger number of false-negative findings for numbness of the fingertips, because we used a relatively low-sensitivity instrument to diagnose diabetic neuropathy (Pain Vision PS-2100, NIPRO, Osaka, Japan) [16]. In addition, in qualitative analysis, women experienced loss of vitality and friendship due to strict self-management and prejudice against diabetes, which created greater psychological stress among women. Indeed, women perceived fear of a hypoglycemic attack while shopping, which agreed with the qualitative results of difficulty of acquiring goods and services in daily life (d620). Further, women were more likely than men to report that they were impeded by the attitudes of friends (e420) and experienced unpleasant reactions after disclosing to others that they had been diagnosed with diabetes (e465). These qualitative findings are consistent with quantitative results, again reporting prejudice against diabetes. In short, these findings suggested that women were sensitive to negative attention from close friends and relatives.

Men experienced prejudice against diabetes from family and work colleagues, which they felt was as a result of excessive media attention on diabetes treatment, and this also led their families to act like diabetes police in qualitative analysis. The poor understanding in the workplace of diabetes negatively affected implementation of patient self-management. Indeed, men perceived fear of

losing job opportunities. Tak-Ying Shiu et al. [17] reported that patients were at risk of losing their job if they disclosed they had diabetes to their colleagues or employers. Sato et al. [18] reported that patients with diabetes have access to a very limited choice of occupations because employers do not wish to hire workers with health problems. A number of studies have shown that under such circumstances, male patients with diabetes are more likely to become distressed. Men expressed unpleasant feelings toward families who behaved like diabetes police, e.g., restricting food items. Regardless, men were generally able to implement good self-management, as they tended to be well supported by their families and friends [19].

Fear of hypoglycemic attacks and diabetic complications among women in our study agreed with previous findings [20, 21]. A study conducted in five Asian countries reported that women were more likely to report health and life dissatisfaction when asked: "How satisfied are you with your health or life?" [20]. In addition, a patient survey conducted by the Japanese Ministry of Health, Labour and Welfare in 2011 [21] reported that women had a higher rate of outpatient diabetic clinic appointments than did men, indicating that Japanese women tend to be more concerned about their health status.

Our quantitative results found that women were more likely to be influenced by social norms, practices, and ideologies compared with men and also more sensitive to unpleasant reactions from others after disclosing their diagnosis of diabetes. Previous studies reported that because it is difficult for a woman to disclose that she suffers from diabetes, she is less likely to inject herself at a party, as she may not want unwelcome comments or to spoil the party atmosphere [19, 22, 23]. Women tend to be more sensitive than men to responses of others, which creates greater psychological stress around implementing self-management. In contrast, although our quantitative results showed men were less likely to report being affected by social norms, practices, and ideologies compared with qualitative results, men perceived prejudice from work colleagues, had difficulty injecting insulin at work, and experienced loss of job opportunities. These differences between genders may be explained by the stereotyped male and female roles in Japan, where women are less likely to work and more likely to invest in social relationships than men, and where men focus more on careers and career development.

This study has limitations in addition to its small sample size obtained from two clinics in one prefecture. First, our sample consisting of 64 women (33.2 %) and 129 men (66.8 %) may be slightly different from the source population in Japan and, therefore, sampling bias may exist. Second, we did not collect information on

marital status, whether or not the patient lived alone or with family, or socioeconomic status such as household income.

In conclusion, women with diabetes perceived psychological stress due to prejudice from close family members, friends, and neighbors. In contrast, men with diabetes perceived psychological stress due to close family members acting like diabetes police, and the fear of losing job opportunities and activities of daily living related to implementing self-management. In short, women were more likely to be sensitive to attention from close people, whereas men were more likely to be occupied by work and daily living concerns, attitudes reflecting the stereotypical gender roles embedded in Japanese society. Understanding such gender differences in diabetes management may help health professionals develop better approaches to supporting their patients and thus improving diabetes management.

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Compliance with ethical standards

Conflict of interest None.

Human rights and informed consent All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Declaration of Helsinki, 1964, and later versions. Informed consent or substitute was obtained from all patients.

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